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EXAMINER

WANG, EUGENIA

ART UNIT

PAPER NUMBER

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/053,085	<b>Applicant(s)</b> GORTE ET AL.	
	<b>Examiner</b> EUGENIA WANG	<b>Art Unit</b> 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 26 February 2009.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 2-30,55,56,58-60,62-64 and 66 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 2-30,55,56,58-60,62-64 and 66 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                       | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>10/28/08</u> .  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Response to Amendment***

1. In response to the amendment received February 26, 2009:
  - a. Claims 65 and 67 have been cancelled as per Applicant's request. Claims 2-19, 21-30, 55, 56, 58, 60, 62-64, and 66. (It is noted that although the text for claim 65 remains, the header clearly reads that it is canceled, and therefore it is interpreted to be cancelled.)
  - b. The previous objection to the abstract has been withdrawn in light of the amendment.
  - c. The previous claim objections have been withdrawn in light of the amendment.
  - d. The prior art of record has been used in the current rejection, wherein portions of the previous rejection have been maintained. However, changes to the rejection have been made as well, wherein all changes made to the rejection are necessitated by the amendment. Thus the action is final.

### ***Claim Objections***

2. Claim 58 objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 58, dependent from claim 64 cites that the anode has copper deposited in the pores. However, such a

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limitation is already recited within independent claim 64 (see lines 6-7). Accordingly, claim 58 does not further limit claim 64.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 8 and 29 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 8 and 29 claim a hydrocarbon fuel, wherein methanol is embodied. However, methanol only has one carbon in it, which directly contradicts claims 62 and 63, which claims 8 and 29 depend on. Accordingly, it is uncertain as to what Applicant is claiming - methanol or a fuel with more than two carbons. Clarification as to the nature of the fuel is required.

***Claim Rejections - 35 USC § 103***

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

4. Claims 2, 3, 5-12, 15, 16, 18, 21, 24-30, 62, 63, and 66 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5445903 (Cable '903) in view of US 4812329 (Isenberg), and US 6423896 (Keegan).

As to claims 62, 63, and 66, Cable '903 teach of a solid oxide fuel cell, wherein the assembly (system) is embodied as well (col. 1, lines 5-8; col. 3, lines 49-52). The fuel cell has a cathode [5], an anode [4], an electrolyte, oxygen, and fuel (col. 3, lines 49-62). (As seen in Table II and col. 11, lines 41-50, air and hydrogen are fed to the

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electrode (oxygen (cathode) and fuel (anode), respectively.) The electrolyte is ion transferring and is made of yttria stabilized zirconia (col. 4, lines 57-65). It is noted that yttria stabilized zirconia is inherently an electric insulator.

Where applicant claims a composition in terms of a function, property or characteristic and the composition of the prior art is the same as that of the claim but the function is not explicitly disclosed by the reference, the examiner may make a rejection under both 35 U.S.C. 102 and 103, expressed as a 102/103 rejection.

The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. In re Rijckaert, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993).

“In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art.” Ex parte Levy, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990)

In the case of the instant application the basis for expectation of inherency is the fact that it is the same material as Applicant uses and thus must have the same characteristic of being electronically insulating (see spec p10 line 16 to p 11 line 1).

The Examiner requires applicant to provide that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product.

Whether the rejection is based on inherency’ under 35 U.S.C. 102, on prima facie obviousness’ under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same...[footnote omitted].” The burden of proof is similar to that required with respect to

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product-by-process claims. In re Fitzgerald, 619 F.2d 67, 70, 205 USPQ 594, 596 (CCPA 1980) (quoting In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977)).

The anode [4] is porous and has a metal such as nickel or cobalt blended with an oxide power such as zirconia, ceria, yttria, or doped ceria (ceramics) (col. 5, lines 23-26). Therefore, Cable '903 teaches a fuel electrode that does not have nickel in it\*. (Please see \* for an alternate interpretation.)

As seen in fig. 1, the solid electrolyte [6] and the anode [4] are placed next to each other (overlap), in physical contact (and are thus bound to one another), wherein the contact is seen to be an essentially uninterrupted interface.

\*Alternately it can be interpreted that since Cable '903 does not specifically teach an example of a solid oxide fuel cell, wherein there is no nickel in the anode (as example A in col. 10 uses nickel as the metallic powder). However, in this case, the use of other metallic powders besides nickel would have been obvious to one of ordinary skill in the art, as Cable '903 teaches of the use of cobalt instead of nickel (col. 5, lines 23-26). Therefore nickel and cobalt are art recognized equivalents, and it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute cobalt for nickel with the predictable result of it functioning in a solid oxide fuel cell anode as a metallic powder used in the anode.

Cable '903 does not teach of (a) having ceria deposited in the pores of the anode and (b) using a fuel having a sulfur content from about 1-5000 ppm or (c) the fact that the fuel is a hydrocarbon with two or more carbons.

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As to (a), Isenberg teaches that the fuel electrode (anode) is porous and is impregnated with cerium nitrate, which results in a porous fuel electrode with ceria ( $(\text{CeO}_2)_{0.8}(\text{La}_2\text{O})_{0.2}$ ) impregnated in the porous electrode (col. 6, lines 12-43). The motivation for using ceria based outer coatings (made by such impregnation, resulting in ceria in the pores) is that ceria doping results in proved sulfur tolerance (col. 1, lines 55-68; col. 2, lines 1-27, 54-56; col. 5, lines 3-9; col. 7, lines 1-20 fig. 6). Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to impregnate the fuel electrode of Cable '903 et al. with ceria (which results with ceria in the pores of the anode) in order to improve sulfur tolerance within the fuel cell.

As to (b), it is first noted that Cable '903 embodies a hydrogen fuel (see table II). Isenberg embodies a hydrogen fuel with 50 ppm hydrogen sulfide in it (col. 2, lines 60-67; col. 7, lines 1-20). Such a teaching applies to Cable '903, as Isenberg renders obvious the fact that using a fuel (for example hydrogen) with a 50 ppm sulfur impurity would still result in an operating fuel cell, if ceria were present in the pores. Accordingly, the combination of Cable '903 and Isenberg with respect to (a) (having ceria deposited in the pores) would render obvious the use of such a fuel (hydrogen fuel with a 50 ppm sulfur impurity), since such a substitution of such a fuel would result in the predictable result of function as a fuel in a solid oxide fuel cell. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to use a fuel with 50 ppm sulfur impurity, as Isenberg teaches hydrogen fuel, wherein a ceria doped anode would be sulfur tolerant up to at least 50 ppm, and thus

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the use of such a fuel in the structure rendered obvious by the combination of Cable '903 and Isenberg would render obvious using such a fuel, since it would have yielded in the predicable result of acting as a functioning fuel in a solid oxide fuel cell. (Note: 50 ppm of hydrogen sulfide is taken to be approximately 50 ppm sulfur, as the weight of the hydrogen portion in hydrogen sulfide is small and negligible.)

As to (c), Keegan teaches a list of possible fuels used in a solid oxide fuel cell system (col. 1, lines 62-64). These fuels include hydrogen (the same fuels embodied by Isenberg and Cable '903) as well as conventional higher hydrocarbon fuels, such as gasoline, diesel, ethanol, kerosene, natural gas, propane, butane, etc. (col. 2, lines 43-45 and 51-60). Accordingly, gasoline, diesel, ethanol, kerosene, natural gas, propane, and butane are all art recognized equivalents for hydrogen for their use as fuels in solid oxide fuel cells (wherein all are hydrocarbons with 2 or more carbons). Furthermore, it is particularly pointed out that the combination of the conventional hydrocarbon fuels can also be combined with the simpler fuels (such as hydrogen) (col. 2, lines 44-65). Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to use diesel, kerosene, gasoline, ethanol, or natural gas or combinations of the aforementioned with hydrogen as fuel (instead of hydrogen), since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416. Furthermore, the replacement of art recognized equivalents with one another would result in the predicable result of acting in the same manner (acting as fuel).



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It is noted that the fuel cell of the combined teaching of Cable '903 and Isenberg inherently has a method of operation to provide electricity using the apparatus, as discussed above (as applied to claims 63 and 66), wherein the reactants are brought in contact with the fuel cell.

It is noted that the fuel cells within the systems/processes of using such defined systems are inherently capable of operating directly with a sulfur-containing hydrocarbon fuel without undergoing treatment to remove sulfur compounds, as such systems are the same as that claimed, barring a showing to the contrary.

As applied to the product claims only:

It has been held that the recitation of an element is "capable" of performing a function is not a positive limitation but only requires the ability to so perform. It does not constitute a limitation in any patentable sense. *In re Hutchinson*, 69 USPQ 138.

While intended use recitations and other types of functional language cannot be entirely disregarded. However, in apparatus, article, and composition claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. *In re Casey*, 370 F.2d 576, 152 USPQ 235 (CCPA 1967); *In re Otto*, 312 F.2d 937, 938, 136 USPQ 458, 459 (CCPA 1963).

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Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. In re Danly, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). See also MPEP § 2114.

The manner of operating the device does not differentiate an apparatus claim from the prior art. A claim containing a “recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

As to claims 2, 3, 5, 6, 21, 22, and 24-26 the combination of Cable '903, Isenberg, Keegan teaches the limitation, as Keegan is relied to teach the use of different fuels in a solid oxide fuel cell, for example diesel (as applied to claims 2, 3, 6, 21, 22, and 26), kerosene (as applied to claims 2, 3, 5, 21, 22, 24), and gasoline (as applied to claims 2, 3, 6, 21, 22, and 25) (all of the aforementioned being petroleum distillates, as applied to claim 2) (col. 2, lines 51-55).

As to claims 9 and 27, the combination of Cable '903, Isenberg, Keegan teach the limitation, as Keegan is relied to teach the use of different fuels in a solid oxide fuel cell, for example butane (as applied to claims 9 and 27), as well as ethanol (an alcohol) (as applied to claim 27) (col. 2, lines 51-55).

As to claims 7, 8, 28, and 29, the combination of Cable '903, Isenberg, Keegan teach the limitation, as Keegan is relied to teach the use of different fuels in a solid oxide fuel cell, for example ethanol (col. 2, lines 51-55).

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As to claims 10-12 and 30, the combination of Cable '903, Isenberg, and Keegan teach the limitation, as Isenberg renders obvious using a fuel (specifically hydrogen, as used in Cable '903 as well) with 50 ppm hydrogen sulfide in it (col. 2, lines 64-67; col. 7, lines 1-20) and Keegan relied upon to render obvious the replacement of hydrogen fuel with higher hydrocarbon fuels (col. 2, lines 43-65). (Please see part (b) and (c) in the rejection of claims 62, 63, 65, and 66 for a full explanation as to how Isenberg and Keegan to such a teaching.) (Note: 50 ppm of hydrogen sulfide is taken to be approximately 50 ppm sulfur, as the weight of the hydrogen portion in hydrogen sulfide is small and negligible.)

As to claim 15, Cable '903's electrolyte conducts ionized oxygen (oxide ion) (col. 4, lines 57-65).

As to claims 16 and 18, Cable '903's electrolyte is yttria stabilized zirconia (col. 4, lines 57-65).

5. Claims 4, 13, 14, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cable '903 in view of Isenberg and Keegan, as applied to claims 62, 2, 10-12, 63, and 22, in further view of US 6221280 (Anumakonda et al.).

As to claims 4 and 23, the combination of Cable '903, Isenberg, and Keegan do not teach the use of JP-4, JP-5, JP-8, or mixtures thereof as the fuel.

However, Anumakonda et al. teach the use of heavier fuels to be used in solid oxide fuel cells, such as JP-8, JP-4, and JP-5 (abs.; col. 1, lines 10-16; col. 2, lines 38-44; col. 4, lines 5-15). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use heavier fuels (JP-8, JP-4, or JP-5) in a solid

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oxide fuel cell, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

Note: The claim language for independent claims 62 and 63 only state that fuel cell system is “capable of directly operating with a sulfur-containing hydrocarbon that does not undergo prior treatment to remove organic sulfur compounds.” This statement only requires that the fuel cell is capable of operating with such a fuel and does not positively limit hydrocarbon fuel itself. Such an interpretation was applied as to the rejection above. For an alternate interpretation, see \*\*\*, below.

\*\*\* Alternately, it would have been obvious to use heavier fuels (with higher sulfur content - up to 0.3 wt% (3000 ppm) but typically between 0.05- 0.07 (500-700 ppm) (col. 2, lines 38-44)). The motivation for using fuels with jet fuels (JP-4, JP-5, JP-8) with higher sulfur content would lie in the fact hat Isenberg teaches that ceria doped anodes can withstand more sulfur impurities. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made, as one of ordinary skill in the art would have been able to appreciate using JP-8, JP-4, and JP-5 in a solid oxide fuel cell without treatment with the predictable result of the fuel cell functioning in the same manner, since Isenberg teaches that ceria doped anodes are more sulfur tolerant.

As to claims 13 and 14, the combination of Cable '903, Isenberg, and Keegan do not teach the use of a sulfur-containing hydrocarbon fuel with a sulfur content from

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about 100 -1000 ppm (as required by claim 13) or 250-1000 ppm (as required by claim 14).

However, Anumakonda et al. teach the use of heavier fuels to be used in solid oxide fuel cells, such as JP-8, JP-4, and JP-5, wherein the aforementioned fuels have a sulfur content of about 0.05 to 0.07 wt.% (500-700 ppm) (abs.; col. 1, lines 10-16; col. 2, lines 38-44).

Motivation for using JP-8, JP-4, and JP-5 has been discussed in the rejection of claims 4 and 23 but are reiterated herein for clarity's sake.

Anumakonda et al. teach the use of heavier fuels to be used in solid oxide fuel cells, such as JP-8, JP-4, and JP-5 (wherein the aforementioned fuels have a sulfur content of about 0.05 to 0.07 wt.% (500-700 ppm)) (abs.; col. 1, lines 10-16; col. 2, lines 38-44). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use heavier fuels (JP-8, JP-4, or JP-5) in a solid oxide fuel cell, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

Note: The claim language for independent claims 62 and 63 only state that fuel cell system is "capable of directly operating with a sulfur-containing hydrocarbon that does not undergo prior treatment to remove organic sulfur compounds." This statement only requires that the fuel cell is capable of operating with such a fuel and does not positively limit hydrocarbon fuel itself. Such an interpretation was applied as to the rejection above. For an alternate interpretation, see \*\*\*, below.

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\*\*\* Alternately, it would have been obvious to use heavier fuels (with higher sulfur content - up to 0.3 wt% (3000 ppm) but typically between 0.05- 0.07 (500-700 ppm) (col. 2, lines 38-44)). The motivation for using fuels with jet fuels (JP-4, JP-5, JP-8) with higher sulfur content would lie in the fact that Isenberg teaches that ceria doped anodes can withstand more sulfur impurities. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made, as one of ordinary skill in the art would have been able to appreciate using JP-8, JP-4, and JP-5 in a solid oxide fuel cell without treatment with the predictable result of the fuel cell functioning in the same manner, since Isenberg teaches that ceria doped anodes are more sulfur tolerant.

6. Claims 17 and 19 rejected under 35 U.S.C. 103(a) as being unpatentable over Cable '903 in view of Isenberg and Keegan, as applied to claims 62, 15, and 16, in view of US 6017647 (Wallin).

As to claims 17 and 19, Cable '903 teaches the use of doped zirconia and doped ceria for the oxide ion conducting electrolyte (col. 4, lines 57-65). Cable '903 does not teach that the electrolyte is gadolinium doped ceria, samarium-doped ceria, yttria-doped ceria, and mixtures thereof (as required by claim 17) or scandium-doped zirconia (as required by claim 19).

Wallin teach a solid oxide fuel cell, wherein the ionically conductive electrolyte includes yttria-stabilized zirconia (also taught by Isenberg), scandium-doped zirconia (as applied to claim 19), gadolinium-doped ceria (as applied to claim 17) (abs; col. 4, lines 49-59). Therefore, Wallin shows that scandium-doped zirconia, gadolinium-doped

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ceria, and yttria-stabilized zirconia are art recognized equivalents. Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to use either gadolinium-doped ceria or scandium-doped zirconia as the electrolyte, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416. Furthermore, the replacement of art recognized equivalents with one another would result in the predictable result of acting in the same manner (oxide ion conducting).

7. Claims 55, 56, and 60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cable '903 in view of Isenberg and Keegan, as applied to claims 62, 63, 65, and 66, in further view of US 5589285 (Cable '285).

As to claims 55, 56, and 60, the combination of Cable '903 and Isenberg does not teach the addition of copper into the pores of the anode.

Cable '285 teaches of doping an anode with sulfur-resistance ceria, wherein an electronically conducting phase, such as copper, is added (col. 10, lines 17-31). The motivation for wanting to include copper in the ceria dopant (which would then impregnate the anode) would be to increase the electronic conductivity throughout the fuel cell and thus improve performance. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to add electronically conductive copper to ceria (as taught by Cable '285), wherein the ceria mixture is used to impregnate the anode for sulfur tolerance (as taught by Isenberg) in order to facilitate electronic conductivity and improve fuel cell operation.

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8. Claims 58 and 64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cable '903 in view of Isenberg, Keegan, and Cable '285.

As to claims 58 and 64, Cable '903 teach of a solid oxide fuel cell, wherein the assembly (system) is embodied as well (col. 1, lines 5-8; col. 3, lines 49-52). The fuel cell has a cathode [5], an anode [4], an electrolyte, oxygen, and fuel (col. 3, lines 49-62). (As seen in Table II and col. 11, lines 41-50, air and hydrogen are fed to the electrode (oxygen (cathode) and fuel (anode), respectively.) The electrolyte is ion transferring and is made of yttria stabilized zirconia (col. 4, lines 57-65). It is noted that yttria stabilized zirconia is inherently an electric insulator.

Where applicant claims a composition in terms of a function, property or characteristic and the composition of the prior art is the same as that of the claim but the function is not explicitly disclosed by the reference, the examiner may make a rejection under both 35 U.S.C. 102 and 103, expressed as a 102/103 rejection.

The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. In re Rijckaert, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993).

"In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." Ex parte Levy, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990)



In the case of the instant application the basis for expectation of inherency is the fact that it is the same material as Applicant uses and thus must have the same characteristic of being electronically insulating (see spec p10 line 16 to p 11 line 1).

The Examiner requires applicant to provide that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product.

Whether the rejection is based on inherency' under 35 U.S.C. 102, on prima facie obviousness' under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same...[footnote omitted]." The burden of proof is similar to that required with respect to product-by-process claims. In re Fitzgerald, 619 F.2d 67, 70, 205 USPQ 594, 596 (CCPA 1980) (quoting In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977)).

The anode [4] is porous and has a metal such as nickel or cobalt blended with an oxide power such as zirconia, ceria, yttria, or doped ceria (ceramics) (col. 5, lines 23-26). Therefore, Cable '903 teaches a fuel electrode that does not have nickel in it\*. (Please see \* for an alternate interpretation.)

As seen in fig. 1, the solid electrolyte [6] and the anode [4] are placed next to each other (overlap), in physical contact (and are thus bound to one another), wherein the contact is seen to be an essentially uninterrupted interface.

\*Alternately it can be interpreted that since Cable '903 does not specifically teach an example of a solid oxide fuel cell, wherein there is no nickel in the anode (as example A in col. 10 uses nickel as the metallic powder). However, in this case, the use of other metallic powders besides nickel would have been obvious to one of ordinary

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skill in the art, as Cable '903 teaches of the use of cobalt instead of nickel (col. 5, lines 23-26). Therefore nickel and cobalt are art recognized equivalents, and it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute cobalt for nickel with the predictable result of it functioning in a solid oxide fuel cell anode as a metallic powder used in the anode.

Cable '903 does not teach of (a) having ceria deposited in the pores of the anode and (b) using a fuel having a sulfur content from about 1-5000 ppm, (c) the fact that the fuel is a hydrocarbon with two or more carbons, or (d) that copper is deposited in the pores of the anode (as required by claims 64 and 58).

As to (a), Isenberg teaches that the fuel electrode (anode) is porous and is impregnated with cerium nitrate, which results in a porous fuel electrode with ceria ( $(\text{CeO}_2)_{0.8}(\text{La}_2\text{O})_{0.2}$ ) impregnated in the porous electrode (col. 6, lines 12-43). The motivation for using ceria based outer coatings (made by such impregnation, resulting in ceria in the pores) is that ceria doping results in proved sulfur tolerance (col. 1, lines 55-68; col. 2, lines 1-27, 54-56; col. 5, lines 3-9; col. 7, lines 1-20 fig. 6). Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to impregnate the fuel electrode of Cable '903 et al. with ceria (which results with ceria in the pores of the anode) in order to improve sulfur tolerance within the fuel cell.

As to (b), it is first noted that Cable '903 embodies a hydrogen fuel (see table II). Isenberg embodies a hydrogen fuel with 50 ppm hydrogen sulfide in it (col. 2, lines 60-67; col. 7, lines 1-20). Such a teaching applies to Cable '903, as Isenberg renders

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obvious the fact that using a fuel (for example hydrogen) with a 50 ppm sulfur impurity would still result in an operating fuel cell, if ceria were present in the pores. Accordingly, the combination of Cable '903 and Isenberg with respect to (a) (having ceria deposited in the pores) would render obvious the use of such a fuel (hydrogen fuel with a 50 ppm sulfur impurity), since such a substitution of such a fuel would result in the predictable result of function as a fuel in a solid oxide fuel cell. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to use a fuel with 50 ppm sulfur impurity, as Isenberg teaches hydrogen fuel, wherein a ceria doped anode would be sulfur tolerant up to at least 50 ppm, and thus the use of such a fuel in the structure rendered obvious by the combination of Cable '903 and Isenberg would render obvious using such a fuel, since it would have yielded in the predictable result of acting as a functioning fuel in a solid oxide fuel cell. (Note: 50 ppm of hydrogen sulfide is taken to be approximately 50 ppm sulfur, as the weight of the hydrogen portion in hydrogen sulfide is small and negligible.)

As to (c), Keegan teaches a list of possible fuels used in a solid oxide fuel cell system (col. 1, lines 62-64). These fuels include hydrogen (the same fuels embodied by Isenberg and Cable '903) as well as conventional higher hydrocarbon fuels, such as gasoline, diesel, ethanol, kerosene, natural gas, propane, butane, etc. (col. 2, lines 43-45 and 51-60). Accordingly, gasoline, diesel, ethanol, kerosene, natural gas, propane, and butane are all art recognized equivalents for hydrogen for their use as fuels in solid oxide fuel cells (wherein all are hydrocarbons with 2 or more carbons). Furthermore, it is particularly pointed out that the combination of the conventional hydrocarbon fuels

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can also be combined with the simpler fuels (such as hydrogen) (col. 2, lines 44-65). Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to use diesel, kerosene, gasoline, ethanol, or natural gas or combinations of the aforementioned with hydrogen as fuel (instead of hydrogen), since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416. Furthermore, the replacement of art recognized equivalents with one another would result in the predictable result of acting in the same manner (acting as fuel).

As to (d), Cable '285 teaches doping an anode with sulfur-resistance ceria, wherein an electronically conducting phase, such as copper, is added (col. 10, lines 17-31). The motivation for wanting to include copper in the ceria dopant (which would then impregnate the anode) would be to increase the electronic conductivity throughout the fuel cell and thus improve performance. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to add electronically conductive copper to ceria (as taught by Cable '285.), wherein the ceria mixture is used to impregnate the anode for sulfur tolerance (as taught by Isenberg) in order to facilitate electronic conductivity and improve fuel cell operation.

(Note: Although claim 64 includes the claim language that a copper salt is used to deposit copper into the pores of the anode, this is product by process limitation, wherein the product of the combination of Cable '903, Isenberg, and Cable'285 would teach of copper in the pores of the anode, thus being the same as the claimed invention.

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Process limitations are not given weight with regards to the product as long as the product is the same of that of the claimed invention.

“[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” In re Thorpe, 777 F.2d, 698, 227 USPQ 964, 966 (Fed. Cir. 1985)(citations omitted).

“The Patent Office bears a lesser burden of proof in making out a case of prima facie obviousness for product-by-process claims because of their peculiar nature” than when a product is claimed in the conventional fashion. In re Fessmann, 489 F.2d 742, 744, 180 USPQ 324, 326 (CCPA 1974). Once the Examiner provides a rationale tending to show that the claimed product appears to be the same or similar to that of the prior art, although produced by a different process, the burden shifts to applicant to come forward with evidence establishing an unobvious difference between the claimed product and the prior art product. In re Marosi, 710 F.2d 798, 802, 218 USPQ 289, 292 (Fed. Cir. 1983). Ex parte Gray, 10 USPQ2d 1922 (Bd. Pat. App. & Inter. 1989). See MPEP section 2113.)

It is noted that the fuel cells within the system of using such a defined system are inherently capable of operating directly with a sulfur-containing hydrocarbon fuel without undergoing treatment to remove sulfur compounds, as such systems are the same as that claimed, barring a showing to the contrary.

It has been held that the recitation of an element is “capable” of performing a function is not a positive limitation but only requires the ability to so perform. It does not constitute a limitation in any patentable sense. *In re Hutchinson*, 69 USPQ 138.

While intended use recitations and other types of functional language cannot be entirely disregarded. However, in apparatus, article, and composition claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. *In re Casey*, 370 F.2d 576, 152 USPQ 235 (CCPA 1967); *In re Otto*, 312 F.2d 937, 938, 136 USPQ 458, 459 (CCPA 1963).

Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danly*, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). See also MPEP § 2114.

The manner of operating the device does not differentiate an apparatus claim from the prior art. A claim containing a “recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

***Response to Arguments***

9. Applicant's arguments filed February 26, 2009 have been fully considered but they are not persuasive.

**(1a)**

(1) Applicant argues that Cable '903 and Isenberg teach away from one another and from the claimed invention, because Cable criticizes direct bonding of the anode and the electrolyte and states that an element may be positioned between the electrode and electrolyte (with respect to US 4582766, a different Isenberg reference than the one currently relied upon in the rejection) (as set forth in col. 2, lines 38-41 and 46-52).

Examiner respectfully disagrees for the following reasons: (a) such an argument is irrelevant and (b) Cable '903 does not constitute a teaching away from Isenberg. Reasons as to these positions are set forth below.

(a) Applicant's argument is irrelevant:

It is noted that within the current rejection, Isenberg is only being relied upon to provide ceria into the pores for sulfur tolerance purposes. Accordingly, the combination is with respect to the ceria, and not direct towards the anode/electrolyte interface. Furthermore, it is noted that the inclusion of ceria in an electrode, regardless of the anode/electrolyte of interface, would provide the same affect to the electrode - sulfur tolerance. Accordingly, it is seen that one of ordinary skill in the art would be able to combine the teaching within Isenberg, with respect to ceria improving sulfur tolerance, and apply it to other solid oxide systems, wherein the same characteristic of improved sulfur tolerance would be expected. Applicant has not given any proof or reasoning as

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to how the electrolyte/anode interface would affect the characteristic of ceria for sulfur tolerance or how the results of this combination would yield any unexpected results. Accordingly, the arguments are seen to be irrelevant, as they do not address the rejection as set forth, and are thus not convincing. Thus the rejection of record is maintained

Additionally, it is noted that electronically conducting particles are only optional in Cable '903 (i.e. are not necessarily present within the anode) (col. 5, lines 23-36). Accordingly, there is not necessarily bonding between the electronic conductors (metals) and electrolyte, which is what Cable '903 is criticizing in col. 2, lines 30-43. Accordingly, the condition which Cable '903 is criticizing (about Isenberg) may not even exist. Accordingly, arguments as to the fact that Cable '903 criticizes the metal/ceramic expansion differences (within the electrode and electrolyte, respectively) is not germane to the rejection of record, as metal expansion may not problem within Cable '903 (as its inclusion is not necessary). Accordingly, the argument is not seen to be relevant to the rejection, and is unconvincing. Thus the rejection of record is maintained.

(b) Cable '903 does not teach away from Isenberg:

Although Cable '903 may teach that there may be disadvantages to the bonding of Isenberg, this does not specifically constitute a teaching away. It does not negate the fact that Cable '903 teaches an example wherein the anode material is coated directly to the surface of the electrolyte (col. 5, lines 5-22). Fig. 1, which is embodied by Cable'903, shows direct bonding between the anode and the electrolyte as well. Examiner submits that although a microslip layer may be preferred, the entire disclosure



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of Cable '903 clearly shows that they recognize that a fuel cell without such a layer would still be known to work to one of ordinary skill in the art. Accordingly, consideration of the entire reference of Cable '903 would include a teaching of a directly bonded anode/electrolyte. Thus, Applicant's arguments are not found to be convincing, and the rejection of record is maintained.

Furthermore, Examiner would like to submit that Cable '903 (even with the microslip layer) is not teaching that anode material is not being bonded directly to the electrolyte. The microslip material itself is just anode material, wherein it is embodied that the electrode is made up of the microslip layer (for example [17] on the anode side) with the bulk electrode (for example [4] anode), wherein this is a continuous layer with a porosity gradient within the anode material (col. 6, lines 11-26). Accordingly, in this manner, it is seen that Cable '903 is merely teaching a porosity gradient through the electrode active material, and in such a manner, it does not constitute a teaching away of having anode material bonded to the electrolyte. Thus, Applicant's arguments are not found to be convincing, and the rejection of record is maintained.

(2) Applicant argues that Cable '903 teaches of the disposition of a microslip zone between col. 5, lines 53-68) and thus teaches away from the bonding of the anode material and the electrolyte.

Examiner respectfully disagrees. As set forth above, the nature of the anode/electrolyte interface is irrelevant to the rejection of record (as the combination is directed towards sulfur tolerance), and Cable '903 does not actually constitute a teaching away (since direct bonding is clearly shown in fig. 1 and since the microslip

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layer is embodied to be made of anode material and is embodied to be continuous with the bulk anode, and thus is bonded with the electrolyte). Please see response to the remarks under section 1a-1 for full details. Again it is emphasized that such arguments are not germane to the rejection of record, as they fail to discuss sulfur tolerance and fail to show any proof as to how the anode/electrolyte interface would affect the addition of ceria. Additionally, it is Cable '903 does not teach away from bonding the anode material and the electrolyte; it is only seen to teach of an improved anode/electrolyte interface, wherein a porosity gradient of the anode would improve the system mechanically. Therefore, such arguments are not found to be convincing, and the rejection of record is maintained.

(3) Applicant argues that their disclosure as well as Isenberg (as relied upon in the reference) includes bonding, wherein Cable '903 criticizes bonding, and thus cannot be combined.

Examiner respectfully disagrees. As set forth above, the combination of Cable '903 with Isenberg is with respect to sulfur tolerance (with the addition of ceria). Applicant has not set forth why the combination would not yield the desired sulfur tolerance and has failed to show that the anode/electrolyte interface would affect the sulfur-tolerance characteristic with the addition of ceria.

It is also noted that Cable '903's disclosure does teach of a directly bonded anode and electrolyte (fig. 1), wherein the preference for a microslip layer does not negate the clear teaching. Additionally, Cable '903's microslip layer [17] is embodied to be anode material, wherein it is made in a continuous layer with the bulk anode [4], thus

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creating a composite anode. Accordingly Cable '903 is merely teaching that a porosity gradient of the anode would improve the mechanical aspects of the invention and thus does not teach away from bonding the anode material and the electrolyte. It is only seen to teach of an improved anode via porosity gradient. Accordingly, it is submitted that Cable '903 is combinable with Isenberg, as Cable '903 is seen to show how to improve anode/electrolyte bonding, and does not constitute a teaching away. Please see response to the remarks under section 1a-1 for full details as to how Applicant's arguments are both irrelevant to the rejection and misguided as to the submission that Cable '903 teaches away from Isenberg (wherein such position is summarized herein). Accordingly, such an argument is not found to be persuasive because: (1) the arguments fail to address the rejection with respect to sulfur tolerance (specifically that no unexpected results are shown), (2) Cable '903's form does not necessary have the feature that it criticizes Cable '903 for having (metal/ceramic interface via anode/electrolyte), (3) Cable '903 does teach of a structure direct anode/electrolyte bond, and (4) Cable '903 teaches of a combined anode comprising the following structure - microslip/bulk anode - wherein the difference between the microslip layer and bulk anode is (and thus would constitute bonding between and anode, wherein the only difference is a porosity gradient through the combined anode).

(4) Applicant argues that the combination of Cable '903 and Isenberg for the purposes of sulfur tolerance is improper, as the MPEP requires the consideration of all parts of a reference (MPEP 2143.02 VI), wherein Applicant submits that the

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combination does not account for the teaching away, wherein no explanation is provided as one of ordinary skill would ignore the teaching away.

Examiner respectfully disagrees and submits that all parts of the disclosure have been considered. Upon considering the entire disclosure, it is still submitted that Cable '903 does not teach away from having bonding between the anode and electrolyte. Full details as to such a reasoning can be found in the response to Applicant's arguments of 1a-1 (specifically section (b), wherein the teaching of Cable '903 is specifically addressed). However, such points are summarized herein for clarity's sake: (1) Cable '903 still teaches an example wherein the anode material is coated directly to the surface of the electrolyte (col. 5, lines 5-22; fig. 1) and (2) Cable '903's microslip material is just anode material, wherein it is embodied that a composite electrode is made up of the microslip layer [17] with the bulk anode [4], wherein this is a continuous layer with a porosity gradient within the anode material (col. 6, lines 11-26). Accordingly, in this manner, it is seen that Cable '903 is merely teaching a porosity gradient through the electrode active material, and in such a manner, it does not constitute a teaching away of having anode material bonded to the electrolyte, the composite anode (as set forth above) is still placed next to the electrolyte.

It is noted that there is no part VI in MPEP 2143.02. However, such a section as cited by Applicant is with respect to a reasonable expectation of success and predictability. Examiner submits that there would be a reasonable expectation that ceria, included in Isenberg for sulfur tolerance, if introduced to the anode of Cable '903 would still be expected to provide the same characteristic (sulfur tolerance), as this

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characteristic is seen to lie with the ceria rather than its combination with a specified anode/electrolyte boundary. As set forth before, Applicant has not provided any evidence to the contrary, and thus such arguments are not seen to be convincing.

Examiner submits that if such a citing in the MPEP is a typographical error, and Applicant meant MPEP 2143.01 VI, Examiner's rejection still follows such a section of the MPEP, as the combination does not change the principle operation of the reference. Specifically, Examiner submits that the addition of ceria, as taught by Isenberg, to the fuel cell of would not render the fuel cell inoperable. Instead, it would yield the predictable result of providing sulfur tolerance. Applicant has not shown any proof or reasoning to the contrary, and thus such an argument is not found to be convincing.

In such a manner, Examiner submits that Applicant has not addressed the nature of the rejection (as it is drawn to sulfur tolerance) and has not considered the entire reference of Cable '903 (as Cable '903 teaches of an example wherein no microslip layer is present, and that even if the microslip layer is present, it is part of the anode, thus constituting an anode/electrolyte bond). Please see the response to 1a-1 as to the full details of the nature of the rejection and the teaching of Cable '903.

(5) Applicant argues that the office action's rejection cannot be reconciled with MPEP 2145.X.D. (as it is improper to combine references wherein the references teach away from their combination).

Examine respectfully disagrees and submits that the whole reference has been considered, wherein the conclusion is drawn that Cable '903 does not teach away from Isenberg. See the response to part 1a-1 for full details (not reiterated herein for

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brevity's sake). Accordingly, Examiner submits that Applicant has not addressed the nature of the rejection (as it is drawn to sulfur tolerance) and has not considered the entire reference of Cable '903 (as Cable '903 teaches of an example wherein no microslip layer is present, and that even if the microslip layer is present, it is part of the anode, thus constituting an anode/electrolyte bond). Furthermore, the addition of ceria, as taught by Isenberg, to the fuel cell of Cable '903 would neither render the fuel cell unsatisfactory for its intended purpose nor change the principle of operation of the reference. The combination, as mentioned above is with respect to ceria and sulfur tolerance, wherein the inclusion of ceria would only yield the predictable result of providing sulfur tolerance. Applicant has not shown any proof or reasoning to the contrary, and thus such an argument is not found to be convincing.

**(1b)**

(1) Applicant argues that H<sub>2</sub>, CO, and methane are not art recognized equivalents and would not result in functioning as fuel in the solid oxide fuel cell does read on two-carbon hydrocarbon fuel (which is not established to be an art recognized equivalent) (newly amended claim).

Examiner respectfully disagrees. With respect to the change in the claim language, the rejection has changed. Accordingly, new relationships are brought to light. It is noted that Cable '903 embodies the use of hydrogen fuel, wherein Isenberg is relied upon to render obvious the use of sulfur containing hydrogen fuel (see the rejection to claims 62, 63, 64, and 66). However, now Keegan is relied upon to show that hydrogen and higher hydrocarbon (2 or more carbon containing) fuels (for example

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gasoline, diesel ethanol, etc (col. 2, lines 43-65)) are art recognized equivalents (see the rejection of claims 62, 63, 64, and 66). Accordingly, Examiner submits Applicant's argument is moot, as Keegan has been relied upon to render obvious the use of higher hydrocarbons in place of hydrogen.

(2) Applicant argues that the use of two-carbon (or greater) fuels is not inherently equivalent to the "art-recognized equivalents" of H<sub>2</sub>, CO, and methane.

Examiner respectfully disagrees with Applicant's submission. Examiner has not set forth that H<sub>2</sub>, CO, and methane is inherently art-recognized equivalents to fuels with two or more carbons. (The only inherency set forth with respect to the rejection appears to be that yttria stabilized zirconia is an electric insulator.) Accordingly, Examiner submits that Applicant's argument is misguided and irrelevant. Additionally, as noted with respect to the response to 1b-1, Keegan is relied upon to show that hydrogen and higher hydrocarbons are art recognized equivalents.

(3) Applicant argues that Isenberg describes only nickel-containing devices, and the claims recite a substantially nickel-free device.

Examiner respectfully disagrees with Applicant's position and submits that Isenberg is not being relied upon to teach of a nickel-free device. Cable '903 either teaches or renders obvious an anode without nickel. Such a position is reiterated herein:

The anode [4] is porous and has a metal such as nickel or cobalt blended with an oxide power such as zirconia, ceria, yttria, or doped ceria (ceramics) (col. 5, lines

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23-26). Therefore, Cable '903 teaches a fuel electrode that does not have nickel in it\*. (Please see \* for an alternate interpretation.)

\*Alternately it can be interpreted that since Cable '903 does not specifically teach an example of a solid oxide fuel cell, wherein there is no nickel in the anode (as example A in col. 10 uses nickel as the metallic powder). However, in this case, the use of other metallic powders besides nickel would have been obvious to one of ordinary skill in the art, as Cable '903 teaches of the use of cobalt instead of nickel (col. 5, lines 23-26). Therefore nickel and cobalt are art recognized equivalents, and it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute cobalt for nickel with the predictable result of it functioning in a solid oxide fuel cell anode as a metallic powder used in the anode.

Accordingly, Examiner submits that such an argument is misguided, as Isenberg is relied upon to render obvious the use of ceria for sulfur tolerance and the fact the use of sulfur containing fuels due to its inclusion. Accordingly, such an argument is not found to be convincing, and the rejection of record is maintained.

(4) Applicant argues that the affidavit included shows that it would be undesirable for having a two-carbon or larger hydrocarbon in a nickel-containing device, as taught by Isenberg (section 9 of the affidavit).

Examiner respectfully disagrees with Applicant's position and submits that Isenberg is not being relied upon to teach of a nickel-free device. Cable '903 either teaches or renders obvious an anode without nickel (see the rejection or the reiteration



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of the position set forth above in the response to 1b-3). Accordingly, it is irrelevant that Isenberg has nickel in it, as the combination (of Cable '903, Isenberg, and Keegan) set forth has a nickel-free device. In such a manner, Applicant is merely addressing the references separately in, rather than the combination, as set forth in the rejection. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

**NOTE:** Examiner would like to take the opportunity at this time to fully address the submitted **affidavit** and the reasons as to why it is not persuasive below.

The affidavit under 37 CFR 1.132 filed February 26, 2009 is insufficient to overcome the rejection of the claims based upon the combination of Cable '903, Isenberg, and Keegan (with respect to using a two-carbon or larger hydrocarbon, C<sub>2</sub>+ hydrocarbon, in a solid oxide fuel cell) as set forth in the last Office action because:

(a) Declarant submits that the invention of the instant application achieves unexpectedly superior results to the alternative devices in the field (section 6 of the affidavit).

Examiner respectfully disagrees and submits that Declarant has not provided any proof showing such unexpected result. Accordingly, such a submission is not seen to be convincing, as no positive proof has been established with respect to this statement.

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(b) Declarant extrapolates that the Office would find it obvious over Cable '903 and Isenberg to use fuels having C2+hydrocarbon fuel and having a sulfur content from about 1-5000 ppm, and submits that higher hydrocarbons behave differently than other fuels (methane, CO, and hydrogen) (sections 7 and 8 of the affidavit).

Examiner respectfully disagrees with Declarant's extrapolation. Although Isenberg is relied upon to provide a fuel with the claimed sulfur content, Keegan is also relied upon to show that hydrogen and C2+hydrocarbons are both known fuels for the use in solid oxide fuel cells (col. 2, lines 43-65). Additionally, although Declarant states that C2+hydrocarbon fuels would behave differently than fuels like CO, H<sub>2</sub>, and methane, there is proof or showing as to this fact. More importantly, Declarant has not provided any showing as to the fact that C2+hydrocarbon fuels cannot be used as fuel in solid oxide fuel cells (which is what Keegan renders obvious). Accordingly, the affidavit is not found to be convincing.

(c) Declarant submits that nickel-based fuel cells may operate on CH<sub>4</sub> or H<sub>2</sub>, but higher hydrocarbon fuels would leave deposits, wherein one of ordinary skill in the art would want to avoid (and would not have used the devices of Cable or Isenberg in conjunction with C2+hydrocarbon fuels) (section 9 of the affidavit).

Examiner respectfully disagrees with Declarant's position, as Cable '903 either teaches or renders obvious an anode without nickel (using copper instead) (see the rejection or the reiteration of the position set forth above in the response

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to 1b-3). Accordingly, the statement in the affidavit is not applicable to Cable '903. Furthermore, Declarant has not provided any proof or showing why such assertions (with respect to the carbon deposits, or with respect the fact that one of ordinary skill in the art would have avoided using C+2 hydrocarbon fuels because of it) are necessarily true, and thus such assertions are seen to be mere conclusory statements. Additionally, no proof, reasoning, or showing has been provided as to the fact that such fuels would not operate in a fuel cell. Accordingly, the affidavit is not found to be convincing.

**(2)**

(1) Applicant argues that Keegan does not (a) cure the structural incompatibility of Cable '903 and Isenberg and (b) that Keegan's hydrocarbon fuels are incompatible with the devices described in Isenberg.

Examiner respectfully disagrees. With respect to (a), Examiner submits that Cable '903 and Isenberg are not structurally incompatible (as set forth in full within the response to issue 1a). With respect to (b), Examiner submits that Applicant's arguments with respect to Isenberg are misguided (as the rejection is with respect to the combination of Cable '903 and Isenberg, specifically that the combination renders obvious a device without nickel). Additionally, no convincing proof has been provided as to why higher (C2+) hydrocarbon fuels are not compatible with the systems as rendered obvious by Cable '903, Isenberg, and Keegan. (See the response to issue 1b.)

**(3) and (4)**

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(1) With respect to the arguments regarding the 103 rejections, Applicant argues that the prior art used to render obvious the rejected claims (Anumakonda and Wallin) do not cure the deficiencies of the rejection to the independent claims. Applicant does not argue how the combination is not proper. Therefore, the Examiner maintains the obviousness rejections and upholds the rejection of the independent claims, as above.

**(5)**

(1) With respect to the arguments regarding the 103 rejections, Applicant argues that the prior art used to render obvious the rejected claims (Cable '258) do not cure the deficiencies of the rejection to the independent claims. Applicant does not argue how the combination is not proper. Therefore, the Examiner maintains the obviousness rejections and upholds the rejection of the independent claims, as above.

(2) Applicant argues that cable '285 (similarly to Cable '903) criticizes electrode/electrolyte bonding and thus teaches away from combining.

Examiner respectfully disagrees. Specifically, that such an argument is irrelevant for the two reasons set forth below.

(a) Within the current rejection, Isenberg is only being relied upon to provide ceria into the pores for sulfur tolerance purposes. Cable '903 is relied upon as the primary reference wherein, as seen in fig. 1, the porous ceramic anode [4] is physically next to the electrolyte [6]. Furthermore, since electronically conducting particles are only optional (i.e. are not necessarily present within the anode) (col. 5, lines 23-36), there would be no bonding between the electronic conductors (metals) and electrolyte, which Cable '285 criticizes. Accordingly, such an argument with respect to Isenberg is

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irrelevant, as the new primary reference, Cable '903, does not have the bonding of the conductive particles as Isenberg does.

(b) Just because the interfaces taught by Cable '285 and Isenberg are different does not mean that they are not combinable. Cable's criticism of the metal/electrolyte interface is due thermal expansion mismatch (col. 1, lines 55-66). However, the portion relied upon in Cable '285 has to do with sulfur tolerance, as is the portion that is relied upon in Isenberg. Accordingly, both are used for the same reason (sulfur tolerance), and accordingly can be combined with respect to such teaching. As previously stated, Isenberg uses ceria, and Cable et al. uses ceria and copper, wherein copper would help facilitate electronic conductivity. Accordingly, although the electrolyte/anode interface is different in Isenberg and Cable '285, both pieces deal with sulfur tolerance. Since both similarly deal with sulfur tolerance, the reliance on both teachings with respect to sulfur tolerance is combinable on this front, as sulfur tolerance is what the references' principle of operation is centered around. Again it is emphasized that the both teachings drawn from Cable '285 and Isenberg deal with sulfur tolerance. Accordingly, it is seen that one of ordinary skill in the art would be able to combine the teachings with respect to sulfur tolerance, and apply it to other solid oxide systems, wherein the same characteristics of improved sulfur tolerance would be expected, as the teachings are drawn to the same characteristic (regardless as to the anode/electrolyte interface). Applicant has not given any proof or reasoning as to how the electrolyte/anode interface would affect the characteristics of sulfur tolerance or how the results of the combination set forth would yield any unexpected results. Accordingly, the arguments are seen to be irrelevant, as

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they do not address the rejection as set forth, and are thus not convincing. Thus the rejection of record is maintained.

**(6)**

(1) Applicant argues that the combination of Cable '903, Isenberg, and Cable '285 are improper for the reasons as set forth previously (specifically that (a) the Cable references are not combinable with Isenberg and that (b) the combination does not address every element of Applicant's claim).

Examiner respectfully disagrees. With respect to (a), Examiner has clearly set forth the reasons as to why the Cable references are still combinable with Isenberg (see the response to issues 1a and 5, above). With respect (b), Examiner has further combined Keegan to render obvious the elements of Applicant's claim, which have been added in this amendment (see the response to issue 1b).

***Conclusion***

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

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extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to EUGENIA WANG whose telephone number is (571)272-4942. The examiner can normally be reached on 7 - 4:30 Mon. - Thurs., EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/E. W./

Examiner, Art Unit 1795

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